A METHOD AND A DEVICE FOR PROTECTION OF PERSONNEL

This invention concerns a method of preventing people from becoming exposed to injury from tools and machines. More particularly, it concerns a method for determining if a person is located within the working range of the particular machine, thereby enabling the stopping of the machine prior to danger arising. The method is well suited for preventing personal injury from automatically controlled machines on a drill floor. This invention also concerns a device for practising the invention.

When using remotely controlled and/or automatically controlled machines, a person may be exposed to danger when located within the working range of the machine.

To overcome this danger, restricting the working range of the machine by means of, for example, a shield or a gate has commonly been used. It is also known to stop machines of this type by means of light rays being interrupted when a person enters the path of the light rays, or by means of a pressure-

sensitive mat providing a signal when a person steps onto the mat.

At larger, remotely controlled and/or automated installations, restricting the freedom of personnel movement by means of, for example, shields becomes unpractical. This may be due to several machines operating within the same space and occasionally overlapping one another, and in such a way that shielding of one machine prevents another machine from performing an operation.

Under such conditions it may also be impractical to use a light-based device, inasmuch as the light used for detecting personnel inadvertently may be interrupted by machines in the area, or by the device being soiled. On a drill floor, such as that known from petroleum activities, several cooperating machines are being moved and are operating, for example, at the rotary table of the drill floor.

Current and prospective regulations concerning work near automated machines establish requirements for protection of areas at which machines of this type operate.

The object of the invention is to remedy the disadvantages of the prior art.

According to the invention, the object is achieved by means of the features disclosed in the specification below and in the subsequent patent claims.

In order to determine if and where a person is located within an area, a foot transceiver connected to a person activates

one or several identifiable transponders placed in the area, after which the activated transponders emit an identifiable signal, preferably via the foot transceiver, onto a main receiver/transmitter. Each received signal then may be referred to a known position.

For example, the foot transceiver may be placed in the person's shoe sole or at another suitable place on the body. In a preferred embodiment, the foot transceiver is of a type that may be charged inductively, thereby not requiring external connection. The foot transceiver is configured to transmit/receive magnetic and/or electromagnetic signals, and the foot transceiver may be configured to be "sleeping", but it is "woken up" by means of, for example, a signal from the main receiver/transmitter.

Transponders are placed in the area of interest, and preferably at a relatively small mutual distance. A distance of 10-20 centimetres has proven practical, and advantageously the transponders, which preferably are of a type without wire connections, may be imbedded in a floor coating.

As compared to the distance between transponders, the transmitter operates within a small range. Thus, one to four transponders will normally be active simultaneously while a person walks across a floor.

When a foot transceiver enters within a predetermined distance of a transponder, the transponder is activated by means of energy from the foot transceiver. The transponder transmits a code to the foot transceiver, which forwards the code in a recognizable format to the main receiver/

transmitter. The code is identifiable, enabling thus to determine which transponder is activated. Each transponder position is known, and thus it becomes relatively simple to determine where the foot transceiver, hence the person, is located.

By linking information concerning the person's whereabouts to the control system of a machine, the machine may be stopped when the person is located within a zone of danger.

It may prove appropriate to coordinate the method according to the invention with, for example, a photocell or a movement detector placed at the entrance of the area of interest, whereby a warning will be provided, or possibly that the machine is stopped if a person not provided with a foot transceiver enters the area.

Transponders preferably are configured in a manner allowing reprogramming of a transponder's signal code by means of a signal coming from the main receiver/transmitter.

Determination of position according to the method is not significantly disturbed by machine movements or by irrelevant signals. At the same time, the method is simple and reliable.

Hereinafter a non-limiting example of a preferred embodiment is described and being illustrated in the accompanying drawing, where:

Fig. 1 shows a perspective sketch of a drill floor on which a person is located within a supervised area;

Fig. 2 shows in a larger scale a section of Fig. 1; and

Fig. 3 shows a flow chart of the method according to the invention.

On the drawings the reference numeral 1 denotes a floor coating formed as a mat placed on the floor 4 of the drill floor 2.

A number of transponders 6 of known type are embedded in the floor coating 1 at a suitable, mutual distance, the transponders 6 being provided with a receiver component, a signal-generating component and a transmitter component. The energy required to emit a signal from the transponder 6 is provided by a foot transceiver 8 placed in a shoe sole 12 of a person 10.

Besides an accumulator, the foot transceiver 8, also of known configuration, is provided with a circuit for generating a magnetic and/or electromagnet field and a circuit for receiving such signals. The foot transceiver 8 is configured for inductive charging and thus may be closely embedded in the shoe sole 12.

When the person 10 is located within a predetermined distance of one of the transponders 6, the foot transceiver 8 activates the transponder 6, the transponder 6 thereby transmitting an identifiable signal back to the foot transceiver 8, which forwards the signal onto a main receiver/transmitter 14.

The position of each individual transponder 6 is known, and when the transponder 6 of interest transmits its identifiable signal via the foot transceiver 8 and the main receiver/ transmitter 14 refers the signal to the current position, the position of the person 10 may be determined, generally by means of several transponders 6 activated simultaneously.

On a drill floor 2 the floor coating 1 containing the transponders 6 is placed on the floor 4 within an area 5 at the drill floor rotary table 16, and in such a way that it also covers the working range of the pipe handling machines 18 of interest.

When a person 10 enters onto the floor coating 1, cf. Fig. 1, the transponders 6 will be activated by the foot transceiver 8 placed in the shoe sole 12 of the person 10, cf. Fig. 2. The one or several transponders 6 transmit(s) its/their identifiable signal(s) via the foot transceiver 8 and onto the main receiver/transmitter 14, whereupon the transponder(s) 6 being activated may be determined. The positions of the individual transponders 6 are known. Thus the position of the person 10 on the drill floor 2 also is known. An operator 20 may receive an overview of the position(s) of person(s) 10 on the drill floor 2 via, for example, a screen. The control system of the pipe handling machines 18 may be provided with information concerning the position of the person 10, and, for example, be programmed to stop if the person 10 enters the working range of the machine 18.

The method also is well suited for determining the position of other objects than persons.